

Multi-Functional Cloud Robotics in Industries using Raspberry Pi

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Abstract - This paper is based on Cloud Robot which is used in Industrial and manufacturing environment. Here Robot Operating System platform and Raspberry Pi is used to control different devices attached to it. This multipurpose robot mainly aims at taking Biometric of an employee using facial recognition, Employee's health monitoring and Industries Environment Monitoring at the same time using different sensors like heart rate sensor measures, air quality and temperature sensors. Camera is used to get visual input of surrounding environment and to capture employee image. If the captured image gets matched with the image that is stored in firebase then attendance for that employee login time will be stored in firebase for documentation. The movement of the Robot is provided by DC motors and the direction is controlled from an android or computer environment using Google firebase. The data inputs from all the sensors are given to raspberry Pi controller and it is then transferred to receiver end using Wi-Fi module.

Key Words: Arduino Uno, Cloud, Firebase, MIT app inventor, Raspberry Pi.

1. INTRODUCTION

In this generation, most of the Organizations depend on the Robots to carry out risky tasks. Some of the risky tasks cannot be done by humans, so they design and develop some robots to minimize their work. Robots play different roles in the field of industries, military and in medical applications. Cloud Robotics is a type of Robotics which is newly developed as a high level technology between cloud computing and robotics operations. It uses wireless networking for communication between cloud and Robot. Cloud Robotics provides extensive storage capacity, performs difficult tasks and it can offload lot of computations like speech recognition, pattern recognition and face recognition using elastic computing model, where the allocation of resources are dynamic.

The robot architecture concentrates on 3 domains: 1. Monitoring Employee's health 2. Monitoring Industries Environment 3. Identifying Biometric of a person using Facial recognition First part of the architecture for this Robot is based on medical sensors which measure patient's physical parameters by using wireless sensor networks (WSNs). These sensors transfer data from patient's bodies over the wireless network to the cloud environment [4].

Thus Internet of Things in the medical field brings out the solution for effective patient monitoring at reduced cost and also reduces the trade-off between patient outcome and disease management using Raspberry Pi board [1]. Raspberry Pi is act as a small clinic after connecting Heart rate sensor [3]. Raspberry Pi collects data from all the sensors and then it transfer to cloud. Second part of the architecture is concentrated on monitoring industry environment and this part of architecture consist air quality and temperature and humidity sensors [2]. These sensors check the air quality, temperature and humidity of the surroundings and transfers data from sensors over the wireless network to the cloud environment. Third part of the architecture is concentrated on taking Biometric of an employee and it consist of camera to get visual input of surrounding environment, OpenCV software for identify face in a live streaming video and facial recognition technique to recognize employee[4]. In facial recognition the captured image will be compared with the images of all employees which are stored in Google firebase if, the face gets matched then attendance for that particular employee will be taken and that will be stored in Google firebase for documentation purpose. Employee's login and logout time will be noted with the help of IR sensors. Cloud Computing is a general expression for any technological services provided through the Internet. Cloud computing provides compatible and on-demand network access for numerous computing resources such as networks, systems, applications, and services. After sensors that are connected to robot collect and transmit data to the cloud, services which are available in this cloud are responsible for receiving, storing, processing, and distributing this data.

1.1 Objectives of the paper

This Paper is aimed at designing and implementation of a movable Robot which performs multiple tasks like:

Take Biometric of Employees in industries/ Banks/ organizations etc., using face recognition system and Monitors Employee health by checking their Pulse rate and also convey their health status through a speaker announcement.

It also monitor how employees are working by capturing live video inside the industry which can also be streamed to owner's phone or computer using cloud Technology.

and checks hazardous Gas levels (Ammonia (NH₃), Nitrogen oxide, Benzene, CO₂, Carbon monoxide and smoke) inside the working premises and in case of gas leakage or smoke detection, alarm the employees through a speaker announcement.

It Monitor Temperature and Humidity levels inside the industry. In case of rise in Temperature beyond a threshold alarm the employees through a speaker announcement and turn on a cooling fan for self-cooling and then Upload all the data obtained to the Cloud for analyses and future usage.

1.2 Scope of the paper

This robot is cost efficient and can be Deployed in chemical, Manufacturing industries, Nuclear Power Station, Banks, Institutes, Offices, Hospitals etc., for: Taking biometric, Monitoring the work premises for Gas leakage, temperature and also detection of unusual activities, Monitoring employee's health, Monitoring how the employees are working and send the video footage to the owner, Maintaining all the record

2. LITERATURE SURVEY

Cloud robotics in industry using Raspberry Pi [2016] objectives: Here the key idea is Raspberry Pi controller to control the various devices(sensor) attached to it.

Air quality monitoring system based on IoT using Raspberry Pi [2017] This paper is to present an real-time standalone air quality monitoring system which includes various parameters: PM 2.5, carbon monoxide, carbon dioxide, temperature, humidity and air pressure.

ECG Telemetry System for IOT Using Raspberry Pi [2018] In this paper, we propose a new This paper presents a method for ECG monitoring based on Cypress Wireless Internet Connectivity for Embedded Devices (WICED) Internet of Things (IoT) platform. ECG data are gathered using a wearable monitoring node and are transmitted directly to the IoT cloud using Wi-Fi.

Enhanced Human Face Recognition Using LBPH Descriptor, Multi-KNN, and Back-Propagation Neural Network [2018]

In this paper, we presented an enhanced approach to improve human face recognition using a back-propagation neural network (BPNN) and features extraction based on the correlation between the training image

3. TECHNOLOGY AND METHODOLOGY

The main components of the proposed system is shown in block diagram, the DTH11 sensor is used to measure the temperature and humidity in the environment , two IR sensors are being used to find whether the employee is entering the industry or leaving the industry i.e. if the first IR sensors senses signal before the second sensor indicates that

the employee is entering the industry in the same way if the second sensor senses signal before first sensor shows that the employee is leaving the industry. The entry time and leaving time of an employee will be stored in firebase and IR sensor also gives the information about total number of people present in the industry. The camera is connected to Raspberry PI module to capture image of an employee for biometric and to live stream the industry working environment. The Raspberry PI module is a Cortex-A53 64-bit SoC works at 1.4GHz frequency.

MQ2 Gas sensor is used to find the hazardous gases level in the industry, Heart rate sensor is used to get the employee pulse rate and L298 motor driver is connected to Arduino UNO Development Board is programmable via Arduino IDE, The main idea of the paper that is methodology beyond the block diagram is This is an Arduino UNO based Wi-Fi enabled microprocessor unit on an Arduino-UNO footprint. The Arduino UNO and Raspberry PI are used as the main controllers to control all the peripherals attached to it. Both Raspberry PI and Arduino UNO has inbuilt support for Wi-Fi to connect to internet.

The Arduino UNO and Raspberry PI will control the complete process and also sends status of industry environment and status of employee health information to firebase. This data is sent to the Firebase for storing the information for documentation. Here we are using firebase as database system as it is easy for developing app in multiple frameworks. Next mobile application

is developed to view and manage Robot movements, people count, temperature value, pulse rate and gas level. Firebase is a mobile and web app development platform that provides developers with a plethora of tools and services to help them develop high-quality apps. The Firebase Real-time Database is a cloud-hosted NoSQL database that lets you store and sync between your users in real time. With just a single API, the Firebase database provides your app with both the current value of data and any updates to that data

3.1 BLOCK DIAGRAM

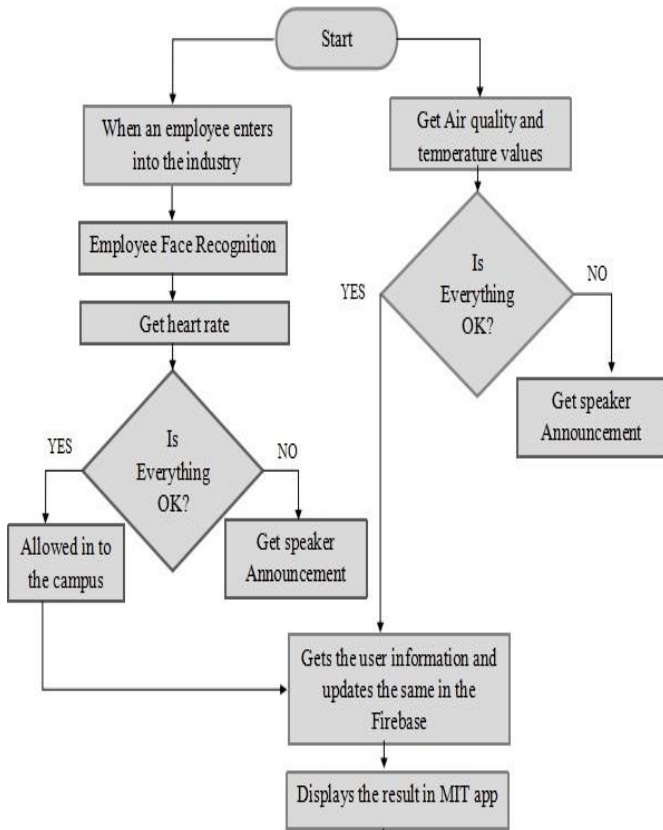
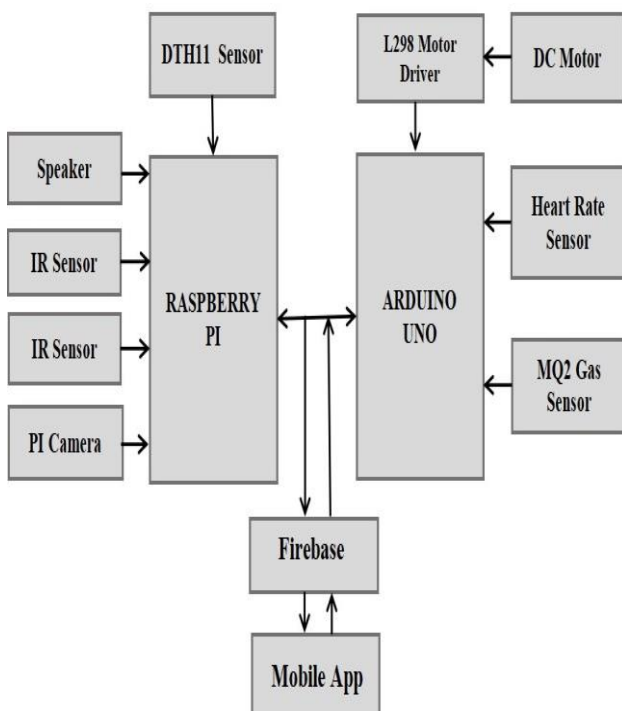


Figure 1: Block Diagram

3.2 FLOW CHART



4. RESULTS AND DISCUSSION

4.1 Multifunctional Robot model

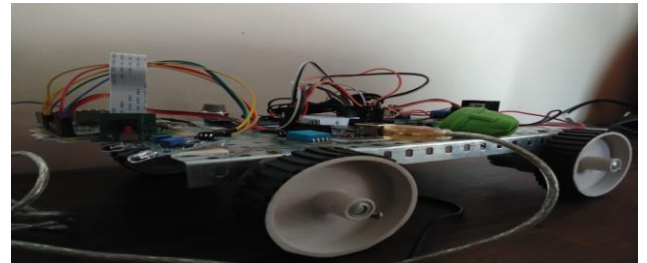


Figure 4.1: Final Model

4.2 It recognizes the face of the employee and marks its

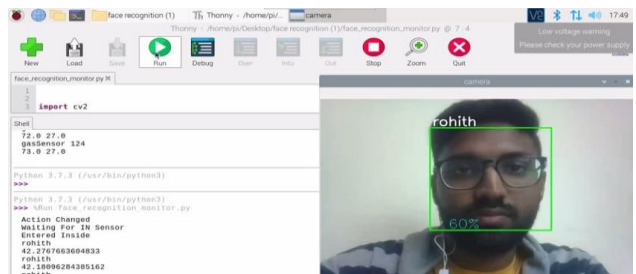


Figure 4.2: Face Recognition

attendance along with that it notes the login and logout time of particular employee.

4.3 It measures the heart rate pulse of an employee.

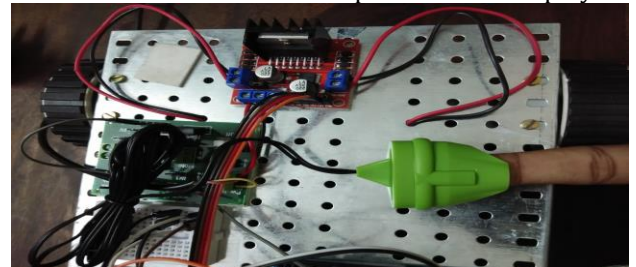


Figure 4.3 : Heart Rate Sensor Input

4.4 Simultaneously it reads temperature, Humidity and gas values inside the industry and all the readings are uploaded into firebase.

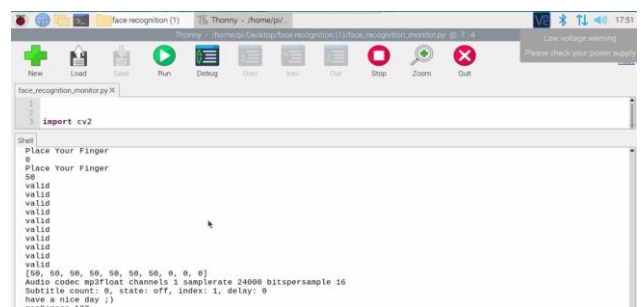


Figure 4.4 : Gas Sensor Output

- 4.5 It captures the live stream inside the Industry to monitor employee activities.
- 4.6 All the data are uploaded into firebase where data can be viewed using MIT app inventor for future analysis.

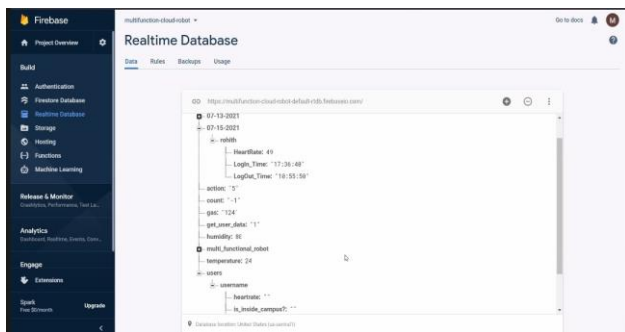


Figure 4.5 : Firebase Output Screen

5. CONCLUSION AND FUTURESCOPE

- A. The proposed framework gives minimal expense, minimized and exceptionally exact framework for distinguishing gas spillage, temperature and moistness in the business and to convey face acknowledgment and heartbeat rate check of individual.
- B. The ongoing business observing framework utilizes a remote sensor network in blend with Internet of things innovation. Information put away in firebase is utilized for Documentation.
- C. This expense effective robot can save heaps of labor and furthermore give an exact data set of the relative multitude of information got from inside the business. With this arrangement, Millions of lives can be saved by recognizing gas spillages in industry
- D. For future proposals, more sensors can be added to identify other air quality.
- E. Snag location for the robot can be added to further develop the robot's working.
- F. By making the robot fly, the whole top perspective on the business can be seen. This will conquer the utilization of CCTV cameras inside the Industry.
- G. This robot can be refreshed as computerized entryway opening framework.

6. REFERENCES

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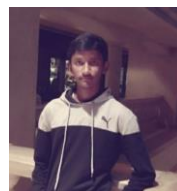
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